UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/944,234	08/31/2001	Andrey V. Zagrebelny	10200/106	1791

7590 12/24/2002

BRINKS HOFER GILSON & LIONE
P.O. Box 10395
Chicago, IL 60610

EXAMINER
LEE, HSIEN MING

ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 12/24/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/944,234	ZAGREBELNY ET AL.	
	Examiner	Art Unit	
	Hsien-Ming Lee	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 October 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) *19-23* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18 and 24-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *31 August 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *4* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of claims 1-18 and 24-26 in Paper No. 6 is acknowledged. The traversal is on the ground(s) that the Office does not provide reasons and/or example to support the restriction requirement. This is not found persuasive because the previous Office Action states " the process as claimed can be practiced by another materially different apparatus that does not require the claimed imbedded code in a machine readable medium for determining polishing time." For example, Takahashi et al. to US 5,830,041 teach the claimed process, as stated as follows, can be performed by an apparatus that comprises a polishing platen; a top ring for pressing the uneven exposed surface; a detector for detecting frictional force; and a processing means (claim 6), wherein the apparatus does not comprise the claimed machine readable medium comprising imbedded code.

For this reason, the requirement is still deemed proper and is therefore made FINAL.

Specification

2. The disclosure is objected to because of the following informalities: on page 6, at line 12, there is a typographical error as to " oxide metal **1**." Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 3, 4, 6-10 and 24-26 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 3 recites the limitation " the pattern density" in line 2. Claim 4 recites the limitation " the composition" in line 2. Claims 6, 7 and 9 recite the limitation "the Cpk of the process" in line 4. Claim 8 recites the limitation " the pattern density" in line 3 and " the composition" in lines 3-4. Claim 9 recites the limitation "the thickness " in line 2 and " the predetermined thickness" in line 6. Claim 10 recites the limitation "the polish rate " in line 2. There are insufficient antecedent basis for these limitation in the respective base claims.

Claims 24-26 render indefinite because these claims are dependent from the non-elected claim 24 as result of the election filed in Paper No. 6.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-2, 5, 9, 10, 12 and 24 are rejected under 35 U.S.C. 102(b) as being anticipated by Takahashi et al. (US 5,830,041).

In re claims 1 and 24, Takahashi et al. expressly teach the claimed method of making a semiconductor structure, comprising:

* determining a first polish time sufficient to planarize a layer on a semiconductor substrate, i.e. determining a first polish time T_1 (Fig.3) by observing current value of the first and second motor 6 and 7 sufficient to planarize a layer 3 (col.6, lines 32-35);

* polishing the layer 3 for said first polish time T_1 to planarize the layer 3 from a level A to a level B as shown in Fig.2A; and

* polishing the layer 3 to a predetermined thickness 3C as shown in Fig.2A.

In re claim 2, Takahashi et al further teach, prior to the determining of said first polish time, measuring the thickness of the layer, i.e. measuring the uneven surface having an upmost level A as shown in Fig.2A.

In re claim 5, Takahashi et al. further teach determining a second polish time T_2 as shown in Fig. 3 sufficient to reduce the thickness of the layer 3 from S_2 to S_3 after planarization to the predetermined thickness S_1; wherein the polishing of the layer 3 to the predetermined thickness comprises polishing the layer for said second polish time T_2.

In re claim 9, Takahashi et al. expressly teach the claimed method of making a semiconductor structure, comprising:

* determining a polish time sufficient to reduce a thickness of a layer on a semiconductor substrate to a predetermined thickness, i.e. determining a polish time T1 (Fig.3) by observing current value of the first and second motor 6 and 7 sufficient to planarize a layer 3 (col.6, lines 32-35);

* polishing the layer 3 such that the layer 3 becomes planar as shown in Fig.2A; and

* polishing the layer 3 for said polish time T_1 to reduce the thickness of the layer 3 after planarization to the predetermined thickness 3C as shown in Fig.2A.

In re claim 10, Takahashi et al. also teach, prior to the determining of said polish time, measuring a polish rate of a blanket wafer because the polish rate is equal to the thickness of the layer to be polished divided by a polishing time.

In re claim 12, Takahashi et al. further teach the claimed method of making a semiconductor structure, including polishing a layer by chemical mechanical polishing, the

improvement comprising determining a first polish time T_1 sufficient to make the layer 3 planar as shown in Fig.2A; determining a second polish time T_E to reduce the thickness of the planar layer 3; and polishing for a third polish time T_2 equal to the sum of the first and second polish times.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 3, 4, 13-18 and 25-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi et al. (US '041) in view of Lofaro (US 6,186,877).

In re claims 3 and 4, Takahashi et al. substantially teach the claimed method as stated above but fail to teach, prior to the determining of said first polish time, measuring a pattern density of the layer and identifying a composition of the layer.

However, Lofaro indicates that in conventional CMP process, the removal rate for polishing the layer needs to be adjusted according to the pattern density of the layer and the composition of the layer (col. 1, lines 29-41 and col.2, lines 7-19).

Therefore, at the time of the invention was made, one of the ordinary skill in the art would have been motivated to measure the pattern density of the layer and identify the composition of the layer for the purposes of determining an appropriate removing rate to avoid undesirable dishing effect (col. 2, lines 7-18, Lofaro).

In re claims 13-18 and 25-26, the given teaching of Takahashi et al. and Lofaro as stated above teach forming a semiconductor device from said structure and forming an electronic device, comprising said semiconductor device. In particular, Lofaro teaches that the CMP process is an indispensable step in the fabrication of integrated circuit devices (col.1, lines 11-15).

9. Claims 6, 7 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi et al. (US '041) in view of Maekawa (US 6,351,723).

Takahashi et al. substantially teach the claimed method as stated above but fail to teach that a Cpk of the method is at least 1.

However, Maekawa teaches that the Cpk value (a value of a deviation process capability) has been monitored in CMP process, wherein the Cpk value needs to be controlled at least 1 to obtain a sufficient process capability (col.6, lines 47-67).

Therefore, it would have been obvious to one of the ordinary skill in the art at the time of the invention was made to diagnose and control the Cpk value at least 1 during the CMP for the purpose of preventing the process from failure (see abstract, Maekawa)

10. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi et al. (US '041) in view of Maekawa (US '723) as applied to claim 7 above, and further in view of Lofaro (US '877).

Takahashi et al. and Maekawa substantially teach the claimed method as stated above but fail to teach, prior to the determining of said first polish time, measuring a thickness of the layer, a pattern density of the layer and identifying a composition of the layer.

However, Lofaro indicates that in conventional CMP process, the removal rate for polishing the layer needs to be adjusted according to the thickness of the layer, the pattern density of the layer and the composition of the layer (col. 1, lines 29-41 and col.2, lines 7-19). Therefore, at the time of the invention was made, one of the ordinary skill in the art would have been motivated to measure the thickness of the layer, the pattern density of the layer and identify the composition of the layer for the purposes of determining an appropriate removing rate to avoid undesirable dishing effect (col. 2, lines 7-18, Lofaro).

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hsien-Ming Lee whose telephone number is 703-305-7341. The examiner can normally be reached on M-F (9:00 ~ 5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are 703-305-0142 for regular communications and 703-305-0142 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Hsien Ming Lee
December 23, 2002